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(54) Title of Invention: Quick Drying Enhancing Agent, Quick Drying Cleaning Agent, and Quick Drying Finishing Agent

(21) [Application Number] Application 2001-384210 (P2001-384210)
(22) [Application Date] December 18, 2001

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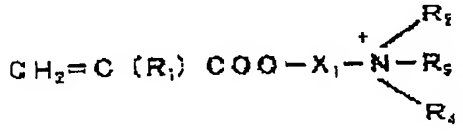
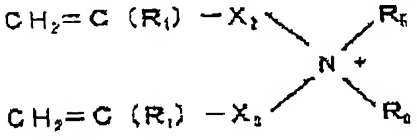
(57) [Abstract]
[Problem] To provide a quick drying enhancing agent or the like which can effectively modify a surface and contribute to excellent quick drying.
[Resolution Means] A quick drying enhancing agent comprising a cationic copolymer having a cationic component section derived from cationic monomer of at least one of general formula (1) or (2), and a component section containing an alkylene oxide derived from monomer comprising an alkylene oxide group expressed by general formula (3), wherein the amount of the cationic component section is between 30 and 99 component mol%, and the amount of the component section containing an alkylene oxide is between 1 and 70 component mol%.
[Formula 5]



General Formula (1)



General Formula (2)

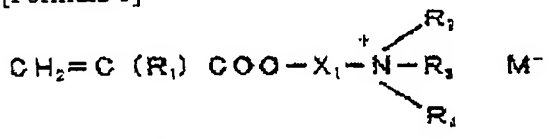
$CH_2=C(R_7)COO-(C_nH_{2n}O)_m-R_8$ General Formula (3) R_1 and R_7 are either a hydrogen atom or an alkyl group with between 1 and 4 carbon atoms, R_2 through R_6 are alkyl

groups with between 1 and 4 carbon atoms, X_1, X_2 and X_3 are alkylene groups with between 2 and 4 carbons, M^- is an anionic counterion, R_8 is either an alkyl group or a phenyl group with between 1 and 4 carbons, n is an integer between 2 and 4, and m is between 2 and 50.

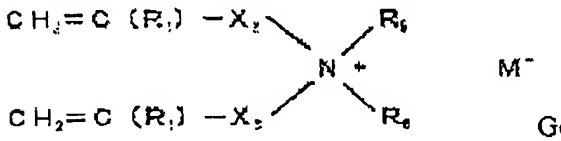
What is claimed is:

[Claim 1] A quick drying enhancing agent comprising a cationic copolymer having a cationic component section derived from cationic monomer of at least one of the following general formula (1) or the following general formula (2), and a component section containing an alkylene oxide derived from monomer comprising an alkylene oxide group expressed by the following general formula (3), wherein the amount of the cationic component section is between 30 and 99 component mol%, and the amount of the component section containing an alkylene oxide is between 1 and 70 component mol%.

[Formula 1]



General Formula (1)



General Formula (2)

$CH_2=C(R_7)COO-(C_nH_{2n}O)_m-R_8$ General Formula (3)

In general formula (1) and (2), R_1 represents either hydrogen or an alkyl group with between 1 and 4 carbons. R_2 through R_6 independently represent alkyl groups with between 1 and 4 carbons. X_1, X_2, and X_3 independently represent alkylene groups with between 2 and 4 carbons. M^- is an anionic counterion. In general formula (3), R_7 represents either a hydrogen atom or an alkyl group with between 1 and 4 carbons. R_8 represents either a phenyl group or an alkyl group with between 1 and 4 carbons. n is an integer between 2 and 4. m is between 2 and 50.

[Claim 2] The quick drying enhancing agent according to Claim 1, wherein the cationic copolymer also has no more than 15 component mol% of structural units derived from polymeric unsaturated monomer.

[Claim 3] A quick drying cleaning agent containing the quick drying enhancing agent shown in either Claim 1 or 2.

[Claim 4] A quick drying finishing agent containing the quick drying enhancing agent shown in either Claim 1 or 2.

[Detailed Description of the Invention]

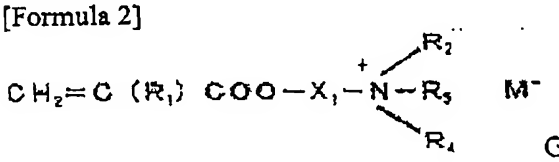
[0001]

[Technical Field of the Invention] The present invention relates to a quick drying enhancing agent, which can provide excellent quick drying properties to hard surfaces such as glass, ceramics, metal, and plastic, and to soft services such as hair, skin, fiber, and leather and the like, and also relates to a quick drying cleaning agent and a quick drying finishing agent which uses said quick drying enhancing agent.
[0002]
[Background Technology] Conventionally, technology for "quick drying" has been developed for processing agents and machining agents for hard surfaces such as glass, ceramic, metal, and various types of plastic as well as for soft surfaces such as hair and fiber. However, in the field of cosmetics and fields relating to fiber processing, "quick drying" refers to the technology to drying of a film or the like using the volatility of a solvent are certain types of chemicals, and is considered to be secondary. On the other hand, in the field of cleaning agents, when cleaning electrical components quick drying solvents with high volatility are used as a solvent medium (for instance refer to Japanese Unexamined Patent Application H05-185042, Japanese Unexamined Patent Application H05-331491, Japanese Unexamined Patent Application H07-179890, and Japanese Unexamined Patent Application 2001-107088). This is because when water is used as a solvent medium, scales will remain and work is required for drying.
[0003] Furthermore, technology has been disclosed that contributes to quick drying performance for washing dishes or the like using lecithin, mono or polyglycerin fatty acid ester, or urea or the like as a rinsing agent for an automatic dishwasher. (Refer to Japanese Unexamined Patent Application S61-276900 concerning lecithin, Japanese Unexamined Patent Applications H05-239497 and H05-255698 concerning mono and polyglycerin fatty acid esters, and Japanese Unexamined Patent Application S61-120900 concerning urea.) However, all of these proposals have problems with insufficient quick drying properties because when a surfactant is added to and used coexistant in a cleaning agent, the quick drying enhancing agent is rinsed off. Furthermore, a shampoo formulated with fluoridated oil and silicon derivative as a quick drying hair cosmetic agent has been disclosed in Japanese Unexamined Patent Application 2000-344633, but there was a problem with an unsatisfactory level of quick drying.
[0004]
[Problem to be Resolved by the Invention] The present invention resolves the aforementioned conventional problems, and attempts to achieve the following objectives. In other words, an object of the present invention is to provide a quick drying enhancing agent which can effectively modify hard and soft surfaces and the like without being washed off during rinsing and the like, and to provide a quick drying cleaning agent that contains this quick drying enhancing agent and can provide excellent cleaning properties and quick drying properties, and also to provide a quick drying finishing agent that contains the quick drying enhancing agent and can provide excellent finishing effects and quick drying properties.
[0005]
[Means for Resolving Problems] Means for resolving the aforementioned problems are as shown below. Namely, <1> A quick drying enhancing agent comprising a cationic copolymer having a cationic component section derived from cationic monomer of at least one of the following general formula (1) or the following general formula (2), and a component section containing an alkylene oxide derived from monomer comprising an

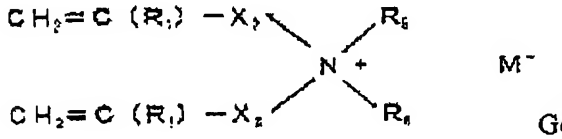
alkylene oxide group expressed by the following general formula (3), wherein the amount of the cationic component section is between 30 and 99 component mol%, and the amount of the component section containing an alkylene oxide is between 1 and 70 component mol%.

[0006]

[Formula 2]



General Formula (1)



General Formula (2)

$CH_2=C(R_7)COO-(C_nH_{2n}O)_m-R_8$ General Formula (3)

[0007] In general formula (1) and (2), R_1 represents either hydrogen or an alkyl group with between 1 and 4 carbons. R_2 through R_6 independently represent alkyl groups with between 1 and 4 carbons. X_1, X_2, and X_3 independently represent alkylene groups with between 2 and 4 carbons. M^- is an anionic counterion. In general formula (3), R_7 represents either a hydrogen atom or an alkyl group with between 1 and 4 carbons. R_8 represents either a phenyl group or an alkyl group with between 1 and 4 carbons. n is an integer between 2 and 4. m is between 2 and 50.

[0008] <2> The quick drying enhancing agent according to the aforementioned <1>, wherein the cationic copolymer also has no more than 15 component mol% of structural units derived from polymeric unsaturated monomer.

<3> A quick drying cleaning agent containing the quick drying enhancing agent shown in the aforementioned <1> or <2>.

<4> A quick drying finishing agent containing the quick drying enhancing agent shown in the aforementioned <1> or <2>.

[0009]

[Implementation Form of the Invention] The present invention will be described below in detail.

[Quick Drying Enhancing Agent] The quick drying enhancing agent of the present invention comprises a cationic copolymer, and if necessary may comprise other components.

<Structure of Cationic Copolymer> The aforementioned cationic copolymer has cationic component units and component units containing alkylene oxide, and may also have other component units as necessary.

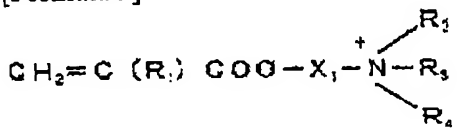
[0010] - Cationic Component Units -

The cationic component units are derived from cationic monomers which are expressed by at least one of either the aforementioned general formula (1) or general formula (2). Note, in the present invention, "cationic component unit" refers to units derived from the

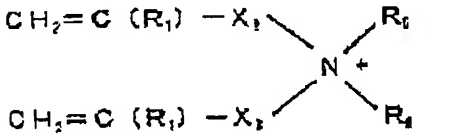
aforementioned cationic monomer in a polymer obtained by polymerizing various types of monomers including said cationic monomer.

[0011]

[Formula 3]



General Formula (1)



General Formula (2)

[0012] In general formula (1) and (2), R_1 represents either hydrogen or an alkyl group with between 1 and 4 carbons. R_2 through R_6 independently represent alkyl groups with between 1 and 4 carbons. X_1, X_2, and X_3 independently represent alkylene groups with between 2 and 4 carbons. M^- is an anionic counterion.

[0013] In general formula (1) and (2), the alkyl groups with between 1 and 4 carbons may also have substitution groups such as hydroxyl groups and halogen groups. From the viewpoint of quick drying performance, R_1 is preferably a hydrogen atom or an alkyl group with 1 or 2 carbons. From the viewpoint of quick drying performance, R_2 through R_6 are preferably independent alkyl groups with between 1 or 2 carbons. In the cationic monomer expressed by general formula (1), R_1 is particularly preferably either a hydrogen atom or a methyl group, from the viewpoint of even more superior quick drying performance, X_1 is also particularly preferably an alkylene group with between 2 and 3 carbons, from the viewpoint of quick drying performance, R_2 through R_4 are similarly alkyl groups with between 1 and 3 carbons, from the viewpoint of quick drying performance, and either a methyl group or an ethyl group is especially preferable. M^- is preferably an anionic ion such as a hydrogen ion, halide ion, sulfate ion, or methyl sulfate ion, from the viewpoint of quick drying performance, and of these, halide ions are preferable, and either chloride or bromide is particularly preferable.

[0014] Specific examples of the cationic monomer expressed by general formula (1) include ethyltrimethylammonium (meth)acrylate, propyltrimethylammonium (meth)acrylate, butyltrimethylammonium (meth)acrylate, ethyltriethylammonium (meth)acrylate, propyltriethylammonium (meth)acrylate, and butyltriethylammonium (meth)acrylate and the like. Of these, ethyltrimethylammonium (meth)acrylate and propyltrimethylammonium (meth)acrylate are particularly preferable from the viewpoint of more excellent quick drying performance. These monomers can be used individually, or two or more types may be used in combination.

[0015] In the cationic monomer expressed by general formula (2), X_2 and X_3 are especially preferably alkylene groups with 2 or 3 carbons, from the viewpoint of more excellent quick drying performance, and an ethylene group is most preferable. R_5 and R_6 are preferably alkyl groups with between 1 and 3 carbons, from the viewpoint of quick drying performance, and either a methyl group or an ethyl group is particularly preferable.

M^- is preferably an anionic ion such as a hydrogen ion, halide ion, sulfate ion, or methyl sulfate ion, from the viewpoint of quick drying performance, and of these, halide ions are preferable, and either chloride or bromide is particularly preferable. Both R_1 can be either the same or mutually different groups.

[0016] Specific examples of the cationic monomer expressed by general formula (2) include dimethyldiallylammonium halide, diethyldiallylammonium halide, dipropyldiallylammonium halide, and dibutyldiallylammonium halide and the like. Of these, dimethyldiallylammonium halide is particularly preferable from the viewpoint of more excellent quick drying properties. These monomers can be used individually, or two or more types may be used in combination.

[0017] The aforementioned cationic copolymer content of the aforementioned cationic component units must be between 30 and 99 component mol%, and is preferably between 50 and 98 component mol%. If the aforementioned content is less than 30 component mol%, adhesion and the tension on the subject of cleaning will be insufficient and sufficient quick drying performance will not be achieved, but on the other hand, if the content exceeds 99 component mol%, the quick drying performance will be reduced. Note, the aforementioned "component mol%" indicates a value that expresses air unit amount (mole) as a percentage when each component unit in the polymer is considered to be one unit.

[0018] - Component Unit Containing Alkylene Oxide Group - The aforementioned component unit containing an alkylene oxide group is a component unit derived from a monomer comprising and alkylene oxide group as expressed by the following general formula (3). Note, in the present invention, "component unit containing alkylene oxide" indicates units derived from monomers that comprise alkylene oxide groups in a polymer obtained by polymerizing various types of monomers that contain monomers comprising the alkylene oxide groups.

$CH_2=C)R_7)COO\text{-}(C_nH_{2n+1}O)_m\text{-}R_8$ General formula (3)

[0019] In general formula (3), R_7 represents either hydrogen or an alkyl group with between 1 and 4 carbons. R_8 represents either a phenyl group or an alkyl group with between 1 and 4 carbons. n is an integer between 2 and 4. m is between 2 and 50.

[0020] In general formula (3), the alkyl groups with between 1 and 4 carbons may also have substitution groups such as hydroxyl groups and halogen groups. R_7 is preferably either a hydrogen atom or an alkyl group with 1 or 2 carbons, from the viewpoint of more excellent quick drying performance, and either a hydrogen atom or a methyl group is even more preferable. R_8 is preferably a hydrogen atom, methyl group, ethyl group, propyl group, or benzyl group or the like, from the viewpoint of quick drying performance. m shows the number of oxyethylene groups, and represents an integer between 2 and 50, and may be an independent value or an average value of values which have a distribution, and is preferably between 2 and 30 from the viewpoint of quick drying performance.

[0021] Specific examples of monomers comprising the aforementioned alkylene oxide group include polyoxyethylene glycol mono(meth)acrylate, polyethylene glycol-polypropylene glycol mono (meth)acrylate, and other polyalkylene glycol mono(meth)acrylates, methoxypolyethylene glycol mono(meth)acrylate, methoxypolyethylene glycol-polypropylene glycol (meth)acrylate, ethoxypolyethylene glycol (meth)acrylate, ethoxypolyethylene glycol-polypropylene glycol (meth)acrylate,

and other polyalkylene glycol mono(meth)acrylates and other alkoxypolyalkylene glycol mono(meth)acrylate that have been alkoxylated with an alkyl group having between 1 and 3 carbon, phenoxypolyethylene glycol mono(meth)acrylate, and phenoxypolyethylene glycol-polypropylene glycol mono(meth)acrylate and the like. These monomers can be used individually, or two or more types may be used in combination.Of these, methoxypolyethylene glycol mono(meth)acrylate or the like is preferable from the viewpoint of a more excellent quick drying performance, and methoxypolyethylene glycol mono(meth)acrylate which has an average of between 2 and 23 repeating units of (C_2H_4O) is even more preferable.

[0022] The amount of component units having an alkylene oxide group in the aforementioned cationic copolymer must be between 1 and 70 component mol%, and is preferably between 2 and 60 component mol%. If the aforementioned amount is less than 1 component mol%, retention to the subject for cleaning will be excessive, and a sense of a freshly cleaned object will be lost, and a favorable clean feel will not be achieved, but on the other hand, if the amount exceeds 70 component mol%, excellent quick drying performance will not be obtained.

[0023] - Other Component Units -

Other component units which are included in the aforementioned cationic copolymer particularly preferably are component units derived from polymeric unsaturated monomers other than the aforementioned "cationic monomer" and "monomer containing an alkylene oxide group". Examples of the aforementioned polymeric unsaturated monomers include hydrophobic vinyl monomer, anionic vinyl monomer, amphoteric vinyl monomer, and other hydrophilic vinyl monomers and the like. These monomers can be used individually, or two or more types may be used in combination.

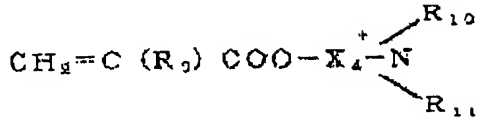
[0024] Examples of the aforementioned hydrophobic vinyl monomers include various types of alkyl (meth)acrylates represented by ethyl acrylate, various types of alkyl (meth)acrylamides represented by propylacrylamide, and hydroxy(alkyl) methacrylates represented by hydroxyethyl (meth)acrylates, and the like.

[0025] Examples of the aforementioned anionic vinyl monomer include for instance, sulfonic acids such as vinylsulfonic acid, allylsulfonic acid, methacrylsulfonic acid, styrenesulfonic acid, and 2-acryllamido-2-methylpropanesulfonic acid and the like, carboxylic acids having a vinyl group such as (meth)acrylic acid, itaconic acid, and N-acryloylglycine and the like, as well as phosphonic acids such as vinylphosphonic acid, vinyl phosphate, and acedophosphoxyethyl (meth)acrylate and the like. The aforementioned anionic vinyl monomer can be used as a salt thereof, or in the form of a blend of the salt and the acid. Examples of these salts include salts formed with basic compounds such as ammonia, triethylamine, and triethanolamine, in addition to alkali metal salts.

[0026] Examples of the aforementioned amphoteric vinyl monomers include betaine type monomers obtained by a method of reacting a monomer containing a tertiary amino group expressed by the following general formula (4) with a halogenated fatty acid such as chloroacetic acid or bromopropionic acid, or an amineoxidetype monomer obtained by a method of similarly reacting monomer containing a tertiary amino group as expressed by the following general formula (4) with hydrogen peroxide.

[0027]

[Formula 4]



General Formula (4)

[0028] In general formula (4), R_9 is a hydrogen atom or an alkyl group with between 1 and 4 carbon, R_{10} and R_{11} are independently alkyl groups with between 1 and 4 carbons, and X_4 is an alkylene group with between 2 and 4 carbons.

[0029] Specifically, preferable examples of the monomer containing a tertiary amino group expressed by the aforementioned general formula (4) include dimethylaminoethyl (meth)acrylate, dimethylaminopropyl (meth)acrylate, dimethylaminobutyl (meth)acrylate, diethylaminoethyl (meth)acrylate, diethylaminopropyl (meth)acrylate, diethylaminobutyl (meth)acrylate, dipropylaminoethyl (meth)acrylate, dipropylaminopropyl (meth)acrylate, and dipropylaminobutyl (meth)acrylate and the like, and dimethylaminoethyl (meth)acrylate, dimethylaminopropyl (meth)acrylate, and diethylaminoethyl (meth)acrylate and the like are preferable.

[0030] Examples of the aforementioned hydrophilic vinyl monomer are hydrophilic monomers such as acrylamide and vinylpyrrolidone and the like.

[0031] The content of the aforementioned polymeric unsaturated monomer in the aforementioned cationic copolymer is preferably between 0 and 15 component mol%, and more preferably between 0 and 10 component mol%. If the aforementioned content exceeds 15 component mol%, the adsorption and retention to the cleaning subject will be lost, and favorable quick drying performance will not be achieved.

[0032] <Form of the Cationic Copolymer and Average Molecular Weight>
The form of copolymerization in the aforementioned cationic copolymer is not particularly restricted, and the polymer may be either a random copolymer or a block copolymer. The average molecular weight (weighted average molecular weight) of the aforementioned cationic copolymer is preferably between 1000 and 5 million, more preferably between 5000 and 1 million, and even more preferably between 10,000 and 500,000. Note, the aforementioned average molecular weight can be measured using a commonly known method such as GPC (high-speed liquid chromatography).

[0033] <Manufacturing the Cationic Copolymer>
The method for manufacturing the aforementioned cationic copolymer is not particularly restricted, but solution polymerization or emulsion polymerization or the like is preferable. The polymerization solvent medium used for polymerization may be a low level alcohol such as methanol, ethanol, and 2-propanol, or a low-level ketone such as acetone and the like. These polymerization solvents can be used individually, or two or more types may be used in combination. Furthermore, a solvent blend where these solvents are blended with water may also be used as the polymerization solvent medium. If a solvent blend containing water is used as the polymerization solvent medium, the water content and the polymerization solvent medium is preferably between 10 and 50 mass%, and more preferably between 20 and 35 mass%.

[0034] The polymerization initiator which can be used for polymerization is not particularly restricted so long as the substance is dissolved in solvent before use, and examples include 2,2-azobisisobutylonitrile, 2,2-azobis(2-methylbutylonitrile), 2,2-azobis(2,4-dimethylvaleronitrile), 2,2- azobis(2-amidinopropane) diacetic acid, 2, 2-azobis(N,N-dime ethyleneisobutylamidine), potassium persulfate, ammonium persulfate,

and hydrogen peroxide solution and the like. The amount of the aforementioned polymerization initiator used is preferably between 0.02 and 5 mass% based on the amount of monomer. The polymerization temperature during polymerization will vary depending on the polymerizing nation solvent used, but a range between 40 and 90°C is preferable. The polymerization by is preferably between 3 at 8 hours.

[0035] When manufacturing the aforementioned cationic copolymer, the formulation ratio (molar ratio) of each type of monomer correspond to the ratio of the component mol% of the component units derived from each monomer in the cationic copolymer obtained, and therefore the formulation ratio (molar ratio) of each monomer preferably corresponds to the component mol% ratio of each of the component units in the cationic copolymer.

[0036] When manufacturing the aforementioned cationic copolymer, a monomer which has one or more tertiary amino groups, but preferably 1 group in the molecule, may be copolymerized with the other monomers in place of the aforementioned cationic monomer expressed by general formula (1), and then the tertiary amino nitrogen may be reacted with a cationizing agent, a quaternary compound is then formed by adjusting the pH to 10 or lower in order to obtain the desired cationic copolymer. The aforementioned monomer which has a tertiary amino group in the molecule is particularly preferably a monomer that is expressed by the following general formula (4). Specific examples of preferable monomers expressed by general formula (4) are the same compounds as those presented for the aforementioned "amphoteric vinyl monomer".

[0037] The aforementioned cationizing agent is preferably a cationizing agent such as a halogenated alkyl ($R_{12}X_5$) or a dialkyl sulfate or the like. R_{12} and the halogenated alkyl is preferably an alkyl group with between 1 and 3 carbons. X_5 is preferably Br, Cl, or I or the like. More specific examples of the aforementioned cationizing agent include methyl bromide, methyl chloride, methyl iodide, ethyl bromide, ethyl chloride, ethyl iodide, propylbromide, propyl chloride, propyl iodide, as well as dimethyl sulfuric acid, diethyl sulfuric acid, and dipropyl sulfuric acid and the like. Of these, ethyl bromide, methyl chloride, dimethyl sulfuric acid, and diethyl sulfuric acid and the like are preferable. Furthermore, quaternization can be performed by a reducing the pH from neutral to weakly acidic using HCl, citric acid, phosphoric acid, or sulfuric acid or the like.

[0038] When manufacturing the aforementioned cationic copolymer, if a monomer as expressed by general formula (4) is used, 50 component mol% or more of the amino groups in the cationic copolymer are preferably made to be quaternary, and making 70 component mol% or more to the quaternary is even more preferable.

[0039] The quick drying enhancing agent of the present invention described above contains the aforementioned cationic copolymer, and is therefore not washed off even during rinsing, and can therefore effectively modify both hard surfaces and soft surfaces and the like, can contribute to excellent quick drying properties, and is therefore extremely useful as a variety of products such as cleaning agents and finishing agents for hard surfaces such as glass, ceramics, metal, and plastic as well as for soft surfaces such as hair, skin, fiber, and leather and the like.

[0040] [Quick Drying Cleaning Agent and Quick Drying Finishing Agent]
The quick drying cleaning agent of the present invention contains the aforementioned quick drying enhancing agent of the present invention and if necessary, also contains other components. Furthermore, the quick drying finishing agent of the present invention

contains the aforementioned quick drying enhancing agent of the present invention and if necessary, also contains other components. Therefore, handling will be excellent, and the agent will adhere to the surface, regardless of the condition of the surface of the subject for cleaning, and will not be washed off during rinsing, and therefore excellent cleaning effect and finishing effects as well as excellent quick drying performance can be achieved.
[0041] The cationic copolymer content in the aforementioned quick drying cleaning agent or quick drying finishing agent is preferably between 0.001 and 30 mass%, more preferably between 0.03 and 20 mass%, and even more preferably between 0.05 and 10 mass%. By maintaining the content within the aforementioned numeric range, the effect had by the cationic copolymer can be particularly favorably provided, and furthermore a favorable viscosity will be obtained.
[0042] <Manufacturing Method for Quick Drying Cleaning Agent and Quick Drying Finishing Agent>
The manufacturing method for the aforementioned quick drying cleaning agent and quick drying finishing agent is not particularly restricted, and the method for by adding the aforementioned cationic copolymer may be one of a variety of commonly known methods. Of these methods, a method of adding an aqueous solution containing the cationic copolymer to a cleaning agent are finishing agent composition is preferable, and if desired may be added directly to the solvent during polymerization and then the remaining prescribed quantity of water can be added, or the solvent medium can first be replace by water and then added.
[0043] The aforementioned manufacturing method can also be performed by blending the prescribed amount of a cationic copolymer 10 mass% aqueous solution with an aqueous solution containing a surfactant and other components that was prepared to have a higher solid content concentration than the finished product, and after forming a uniform aqueous solution, adjusting to the desired product concentration and product pH.
[0044] The quick drying cleaning agent and quick drying finishing agent of the present invention described above contain the aforementioned quick trying enhancing agent of the present invention, and are therefore not washed off even during rinsing, and can therefore effectively modify both hard surfaces and soft surfaces and the like, can contribute to excellent quick drying properties, and are therefore extremely useful as a variety of products such as cleaning agents and finishing agents for hard surfaces such as glass, ceramics, metal, and plastic as well as for soft surfaces such as hair, skin, fiber, and leather and the like.
[0045]
[Embodiments] The present invention will be described below using embodiments, but the present invention is not restricted in any way to these embodiments.
[0046] (Embodiments 1 through 12)
- Manufacturing the Cationic Copolymer (Quick Drying Enhancing Agent) - A total of 60 g of each monomer with the composition (molar ratio) shown in Table 1 and 200 g of ethanol were placed in a 1 L 4-opening separable flask equipped with a stir, reflux condenser, and nitrogen gas introduction tube, and dissolved until uniform, and then while stirring, nitrogen gas was introduced through the nitrogen gas introduction tube.
[0047] After 20 minutes, a polymerization initiator solution of 0.8 g of 2, 2-azodisc(2-methyl-butylonitrile) in 100 g of ethanol was added, and polymerization was performed for 6 hours while feeding nitrogen gas in an oil bath at 90°C . The solvent was then

removed from the contents of the flask, and unreacted monomer and odorous residue were removed by dialysis with distilled water, and then the solutions were concentrated and freeze-dried to make the cationic copolymers (quick drying enhancing agents) of embodiments 1 through 12. Note, the component mole% of each component units in the cationic copolymer obtained was at a level corresponding to the formulation ratio of each of raw material monomer (molar ratio shown in Table 1).

[0048] - Measuring the Weighted Average Molecular Weight of the Polymer -each of the cationic copolymers obtained were dissolved in a solvent medium of water/methanol = 4/1 (vol/vol) that included 50 mM of lithium chloride, and then measured using water based GPC (high-speed liquid chromatography) using the same solvent medium as an eluant, and the weighted average molecular weight of the polymer was measured using polyacrylic acid with a known molecular weight as a standard. The results are shown in Table 1.

[0049] - Evaluation of Quick Drying Properties -

A dishwashing composition with the following composition was prepared using each of the cationic copolymers obtained. Each of the dishwashing compositions obtained were heated to 60°C and left overnight, and then evaluated for the presence of insoluble matter. The compositions were then taken on a sponge and made to foam, a dish was washed and then thoroughly rinsed, and then the dish was placed vertically and the time until the dish was free of water was measured and the drying properties were evaluated using the following criteria. The results are shown in Table 1.

[0050]

<Formulation of Dishwashing Composition>

cationic copolymer	0.5 mass%
lairic diethanolamide [probably misspelling for lauric]	10 mass%
alkylamidopropyl acetate betaine	8 mass%
sodium straight chain alkyl benzene sulfonic acid	2.7 mass%
alkyldimethylamine oxide	1 mass%
palm fatty acid diethanolamide	1.3 mass%
ethanol	7.5 mass%
sodium benzoate	5.0 mass%
Perfume	0.2 mass%
purified water	balance

[0051] - Evaluation Criteria for Quick Drying Properties -

◉ : Water eliminated within 30 seconds.

○: Water eliminated between 30 and 60 seconds.

□: Water eliminated between 60 and 300 seconds.

X: Water is eliminated after 300 seconds.

[0052]

Table 1.

Embodiment		1	2	3	4	5	6	7	8	9	10	11	1
Cationic Surfactant	trimethylammonium ethyl methacrylate chloride	60	70	80	95	70	70	--	--	--	--	81	8

	dimethylaminoethyl methacrylate (cat 75%) *	--	--	--	--	--	--	70	--	--	--	--	--
	dimethylaminoethyl methacrylate (50%) *	--	--	--	--	--	--	--	80	--	--	--	--
	dimethylaminoethyl methacrylate (cat 20%) *	--	--	--	--	--	--	--	--	--	--	--	--
	dimethyldiallyl ammonium chloride	--	--	--	--	--	--	--	--	45	30	--	--
Monomer Containing Alkylene Oxide	methoxypolyoxyethylene methacrylate (m= 2)**	40	--	--	--	--	--	--	--	--	70	--	--
	methoxypolyoxyethylene methacrylate (m= 4)**	--	30	--	--	20	25	30	--	55	--	--	3
	methoxypolyoxyethylene methacrylate (m= 9)**	--	--	20	--	10	--	--	20	--	--	9	--
	methoxypolyoxyethylene methacrylate (m= 23)**	--	--	--	5	--	5	--	--	--	--	--	--
Other Monomers	methacrylic acid	--	--	--	--	--	--	--	--	--	--	10	--
	butyl methacrylate	--	--	--	--	--	--	--	--	--	--	--	5
Molecular Weight Determined by GPC (x10,000) ***		7	12	23.5	8	15	31	100	44	28	5.8	9	4
Evaluation of quick drying properties		(O)	(O)	(O)	(O)	(O)	(O)	(O)	(O)	O	O	O	O

[0053] Note, for items identified with "*" in Table 1, the value in parentheses ( ) designates the quaternary ratio using methyl chloride. For items designated by "**", m represents the polyoxyethylene chain length. For items designated with "***", the value for the PAA standard converted molecular weight (x10,000) is shown.

[0054] (Comparative Examples 1 through 6)

The cationic copolymers of comparative examples 1 through 6 were obtained similar to that of embodiments 1 through 12, except that the monomer used for the formulation in embodiments 1 through 12 was substituted with a monomer of the composition (molar ratio) shown in Table 2, the molecular weight was measured similar to the embodiments 1 through 12, and the quick drying properties were evaluated. The results are shown in Table 2.Note, the component mole% of each component unit in the polymer obtained was at a level corresponding to the formulation ratio of each of raw material monomer (molar ratio shown in Table 2).

[0055]

Table 2

Embodiment		1	2	3	4	5	6
Cationic Surfactant	trimethylammonium ethyl methacrylate chloride	25	70	--	70	--	--
	dimethylaminoethyl methacrylate (cat 75%) *	--	--	54	--	50	--
Monomer Containing Alkylene Oxide	methoxypolyoxyethylene methacrylate (m= 2)**	--	--	--	--	--	--
	methoxypolyoxyethylene methacrylate (m= 4)**	75	--	--	--	--	--

	methoxypolyoxyethylene methacrylate (m= 9)**	--	--	--	--	--	--
	methoxypolyoxyethylene methacrylate (m= 23)**	--	--	--	--	--	--
Other Monomers	methacrylic acid	--	25	36	30	--	70
	methyl methacrylate	--	5	--	--	--	--
	butyl methacrylate	--	--	10	--	50	30
Molecular Weight Determined by GPC (x10,000) ***		22	50	21	47	19	38
Evaluation of quick drying properties		X	Δ	Δ	Δ	X	X

[0056] Note, for items identified with "*" in Table 2, the value in parentheses ( ) designates the quaternary ratio using methyl chloride. For items designated by "**", m represents the polyoxyethylene chain length.For items designated with "***", the value for the PAA standard converted molecular weight (x10,000) is shown.
[0057] (Comparative examples 7 through 12: Evaluation of quick drying properties for commercial cationic copolymers) The rapid drying properties of the commercial cationic copolymers shown in Table 3 (natural and synthetic) were evaluated similar to embodiments 1 through 12. The results are shown in Table 3.
[0058]
Table 3

Comparative Example	Cationic copolymer	Evaluation of Quick Drying Properties
7	cationized dextran	X
8	Mercoat 280 (DMDAAC/AA copolymer)	Δ
9	Mercoat 550 (DMDAAC/AAm copolymer)	X
10	Rubicut 550 (VP/methylimidazolium chloride = 50/50 copolymer)	Δ
11	Rubicut 370 (VP/methylimidazolium chloride = 70/30 copolymer)	Δ
12	Gafcut 755 (VP/DMAEMA) copolymer quaternary salt	Δ

[0059] Note, in Table 3, "DMDAAC" designates polydimethyldiallyl ammonium chloride, "AA" represents acrylic acid, "AAm" represents acrylamide, "VP" represents vinyl pyrrolidone, and "DMAEMA" represents dimethylaminoethyl methacrylate.
[0060] From Table 1 through 3, it can be seen that a dishwashing composition containing the cationic copolymer of the present invention was faster at eliminating water from the entire surface of the plate and achieving a dry surface, and had excellent quick drying properties. Furthermore, this cationic copolymer also had excellent blending properties in the composition, and there was no loss of a freshly washed feel to the dish after drying. This is because the cationic copolymer of the present invention either forms a complex

during the washing and rinsing process are effectively adheres and is retained on the surface of the dish independently, and modifies the surface of the dish to a condition that favorably eliminates water. In contrast, with comparative examples 1 through 6, although there was no hindrance to the blending properties and the freshly washed feel of the plate after drying, the time required for elimination of water was long, and sufficient quick drying properties were not achieved. Furthermore, with comparative examples 7 through 12, favorable quick drying properties were not achieved for either the natural or synthetic systems, even though they were cationic copolymers.

[0061] As shown above, it is obvious that the cationic copolymer of the present invention (quick drying enhancing agent) has excellent blending properties in a dishwashing composition, effectively adheres and is retained on the surface of a plate during the washing and rinsing process, provides excellent quick drying properties, and does not hinder the freshly cleaned feel of a plate.

[0062] (Embodiment 13: Preparation of Quick Drying Finishing Agent and Performance Evaluation) 1 mass% aqueous solution were prepared using the cationic copolymers obtained in embodiments 1 through 3. An appropriate quantity thereof was placed in a wash pan and diluted, and then a washed and rinsed plate was immersed in this solution and then lightly rinsed, and the quick drying properties were evaluated similar to embodiments 1 through 12. When compared to a plate which was not immersed in the prepared finishing agent (1 mass% aqueous solution of cationic copolymer), the time until elimination of water was shorter, and excellent quick drying properties were confirmed. Furthermore, water elimination of dishes was improved and dishes were dried quickly without the use of a dryer or the like when an appropriate quantity of this finishing agent (1 mass% aqueous solution of cationic copolymer) was added during the rinsing process of an automatic dishwashing machine.

[0063] (Embodiment 14: Preparation and Performance Evaluation of a Quick Drying Cleaning Agent for Clothing) A cleaning agent composition for clothing was prepared with the following composition using these cationic copolymer obtained in embodiments 1 through 3, and the cationic copolymers evaluated as comparative examples 10 and 12. T-shirts were washed in a washing machine using the cleaning agent for clothing obtained, and after rinsing, water was removed for three minutes. Furthermore, a sweater was a hand washed and rinsed, and then water was removed for 1 minute. The washed clothing were hung and dried indoors and the sense of dryness was evaluated by the following evaluation criteria. The evaluation results when the T-shirts were washed is shown in Table 4, and the evaluation results when the sweater was washed is shown in Table 5.

[0064]

Composition of Cleaning Agent for Clothing	
polyoxyethylene lauryl ether (average POE chain length 9 mol)	20 mass%
sodium laurylbenzene sulfonate	2 mass%
cationic copolymer	1.5 mass%
Perfume	0.2 mass%
water	balance

[0065] - Evaluation Criteria for Sense of Dryness -

◎ : Sufficiently dry.

o: Slightly damp but mostly dry.
□: Surface is dry, but the core contains moisture.
X: Water content is unchanged after water removal.
[0066]
Table 4

Polymer	Immediately after removing water	1 hour later	3 hours later	6 hours later
Cationic copolymer obtained by embodiment 1	X	O	(O)	(O)
Cationic copolymer obtained by embodiment 2	X	O	(O)	(O)
Cationic copolymer obtained by embodiment 3	X	O	(O)	(O)
Cationic copolymer using comparative example 10	X	X	Δ	Δ
Cationic copolymer using comparative example 12	X	Δ	Δ	O

[0067]
Table 5

Polymer	Immediately after removing water	1 hour later	3 hours later	6 hours later
Cationic copolymer obtained by embodiment 1	X	Δ	O	O
Cationic copolymer obtained by embodiment 2	X	Δ	O	O
Cationic copolymer obtained by embodiment 3	X	Δ	O	O
Cationic copolymer using	X	X	Δ	Δ

comparative example 10				
Cationic copolymer using comparative example 12	X	X	Δ	Δ

[0068] From Table 4 and 5, it can be seen that when a cleaning agent composition for clothing formulated with a cationic copolymer obtained by embodiment 1 through 3 was used, the clothing dried faster than when a cleaning agent composition for clothing formulated with a cationic copolymer obtained as comparative example 10 and 12.
[0069] (Embodiment 15: Preparation and Performance Evaluation of a Quick Drying Shampoo) A shampoo with the following composition was prepared using the cationic copolymer obtained for embodiment 2 and the cationic copolymer evaluated for comparative example 9. Using the shampoos obtained, a panel of five testers washed their hair on half of their head using each shampoo, followed by rinsing, wiping with a towel, and then combing. Next, without using a dryer, the drying process of the hair was observed and evaluated according to the sense of dryness evaluation criteria shown below. The results are shown in Table 6.
[0070]

Shampoo Formulation	
cationic copolymer	0.8 mass%
sodium POE (3) alkylether sulfate	10 mass%
alkylamidopropyl acetate betaine	4 mass%
alkyldimethylamine oxide	2 mass%
palm fatty acid diethanolamide	4 mass%
sodium sulfate	2 mass%
purified water	balance

[0071] - Evaluation Criteria for Sense of Dryness -
X: Moisture clearly remains and hair is in bundles
□: Bundles are broken, but the core contains moisture
o: The roots are slightly damp, but the hair is dried from the middle to the ends
◉ : Completely dry
[0072]
Table 6

Polymer	Immediately after towel drying	10 minutes later	30 minutes later	60 minutes later
Cationic copolymer obtained by embodiment 2	Δ	O	O	(O)
Cationic copolymer used in comparative example 9	X	Δ	Δ	O

[0073] From Table 6, it can be seen that after 30 minutes, the hair which used a shampoo formulated with the cationic copolymer used for comparative example 9 had moisture remaining and was in bundles, but hair which used a shampoo formulated with the cationic copolymer obtained by embodiment 2 was completely dry and fluffy within the same drying time, and the bundles of hair were separated.

[0074]

[Effect of the Invention] The present invention can provide a quick drying enhancing agent that can provide excellent quick drying properties by effectively modifying hard and soft surfaces without being washed away even during rinsing, and can also provide a quick drying cleaning agent that contains the quick drying and enhancing agent and which can provide excellent cleaning properties and quick drying properties, and can also provide a quick drying finishing agent that contains the quick drying enhancing agent and can provide excellent finishing effects and quick drying properties.

Continued from front page

[F terms (reference)]
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